Management of inland open water fisheries resources of Bangladesh: issues and options

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Abstract=200

Despite the possession of a highly productive inland water area of about 45 thousand square kilometers, the continuing decrease in fish catch increasingly threatens the livelihoods of more than 12 million fishers in Bangladesh. The government's open access and leasing policies have been identified as the principal causes of catch decline. Conflicting demands on the inland aquatic area also accelerate drastically the destruction of aquatic resources. Barriers to the access of fishers in the management of inland fisheries resources and over-exploitation by the relatively wealthier non-fisher population are reducing the options for sustaining the livelihoods of fishery dependent communities. The government has pursued a range of initiatives to arrest this continued decline but none has appeared to be appropriate. In this study we investigated the present fisheries management crisis of Bangladesh and justified the opportunities for existing fisheries management to evolve towards community based fisheries management (CBFM) to support the sustainable use of fisheries resources in future.

Author Keywords: Bangladesh; Community based fisheries management; Inland fisheries; Fisheries policy; Resources degradation

1. Introduction

The challenges for sustaining multiple uses of aquatic resources are evident globally. Until recently, traditional management of fisheries resources has commanded a low level of compliance with management measures (Alam and Thomson, 2001; Nielsen et al., 2004) and resulted in over-exploitation leading to resource degradation. Such management has often ignored the socio-economic aspects of small-scale fisheries (World Bank, 1991), generating increasing calls for a tangible change in the process. The most significant issues arising from attempts to change existing fisheries management will be the need for resource protection and equity in the allocation of access to the resource, both between and within the various user groups. However, many developing countries face major constraints in capacity and the ability to identify and achieve implementation of long-term sustainable policies (Rahman, 1992; Williams, 1996).

The country of concern here is Bangladesh, a South Asian country located between latitude 20 ^{o}34′ and 26 ^{o}39′ north and longitude 80 ^{o}41′ and 92°41′ east. It is bordered by India to the west, north and the northeast, Myanmar to the southeast and the Bay of Bengal to the south (Fig. 1). It is a small riverine developing country which covers an area of 144 thousand square kilometers with a population of 140 million.

Its mostly flat terrain is crisscrossed by rivers which together with oxbow lakes (known as Beels and Haors in Bangla), floodplains, marshes and deltas constitute the inland water bodies and associated wetlands that are home to a wide variety of aquatic plants and animals (Craig et al., 2004; Hoggarth et al., 1999) providing thousands of communities with a wide range of benefits including rice production, irrigation facilities, communication facilities, water for rural household use, drinking water, etc. The major river systems, along with their hundreds of tributaries, carry huge volumes of nutrient-rich runoff from their catchments areas which is further enriched by the tropical climate and the nutrients from soil and vegetation during its passage through the numerous flood plains, particularly in the monsoon, when much of the country remains under water (Hossain, 2001; Ali, 1997).

In addition to varieties of aquatic organisms, a total of 260 indigenous freshwater bony fish species suitable for human consumption, belonging to 145 genera and 55 families (Rahman, 1992), constitutes a very rich aquatic bio-diversity (Fig. 2). Within these, Hilsha (*Tenualosa ilisha*) is perhaps the most important single species and highly demanded in the local market. The annual catch of Hilsha is over 0.20 million metric tonnes (Mmt) and accounts for 20% of the country's total fisheries production (FAO, 1995a). Besides the large number of fresh water fish species, there are 24 species of shrimps belonging to five families having a very high commercial value and playing an important role in the economy. Fish from inland waters accounts for an average of 83% of the total fish protein and most of the inland water fish species are only used for domestic consumption.

More than 70% of the population of the country lives in flood plain and coastal areas where the fish and aquatic resources are perceived as exploitable natural capital assets but needing no husbandry. The unrestricted access which fishing communities have to the rivers and floodplains which are the ideal natural breeding grounds for many commercial and non-commercial fish species, has significantly contributed to over-fishing and severe resource degradation. However, the denial of access to certain public fishing grounds which have been leased to private leaseholders has also contributed to making life more difficult for fishing communities.

Fish habitat destruction by the construction of roads and embankments, together with drainage, flood control and natural siltation, along with weak implementation of outdated policy measures by the government, have been commonly cited as causes for the deterioration of the country's fishery resources. Increased use of pesticides and fertilizers for producing high yielding varieties of food crops and rising industrial pollution are also contributing to the deterioration of the aquatic environment (Ali, 1997). The situation has further been complicated by upstream damming in the major river systems that significantly reduces the water level and raises much of the river beds, thus dangerously modifying many of the aquatic habitats of the country. The conflicting demand for agricultural production, particularly rice, encourages attempts to dry out the floodplains, reducing open water areas and destroying their fisheries resources (Fig. 3). Furthermore, population growth, rapid urbanisation and industrialisation are also imposing rapidly growing pressures on aquatic

resources (Alam and Thomson, 2001). Finally, the effects of global climate change, although as yet difficult to predict accurately, are likely to place even further pressures on aquatic habitats. The cost of responding to these pressures has significant implications for the economic development of the country.

Despite the possession of huge aquatic resources, the country increasingly suffers from a high level of resource degradation which has combined with a failure to promote and implement appropriate policy measures to make the population of fisheries-dependent riverine communities very vulnerable. By making use of secondary data sources, mainly reports of the Department of Fisheries, research reports, case studies, NGO reports, scientific journal articles and other published materials including internet resources, this paper aims to review the present fisheries management crisis of the country and identify the scope of opportunities to evolve existing fisheries management strategies to support future sustainable resource use.

2. Brief history of national fisheries regulations

Since Bangladesh's independence in 1971, a range of initiatives have been taken in attempting to find an appropriate fisheries management strategy to halt the further decline of fisheries resources. The government has pursued a largely centralized approach in managing the country's inland fisheries resources. The National Fisheries Policy (NFP) is a major improvement, however, but is viewed as failing to fully recognize the policy issues, including institutional issues, associated with the fisheries sector (Craig et al., 2004). Moreover, the implementation of the NFP, which aimed to place the control of water bodies in the hands of *bonafide* fishers, has been largely sabotaged by powerful local interests (Toufique, 1997).

Despite rigorous government initiatives, the results suggest only a very limited success which has not prevented the fisheries resources of the country moving towards further over-exploitation. Until recently, the defining characteristic of fisheries management policies has been little - if any - significant improvement in achieving their targets (Table 1). The impression is given that the existing

rules and regulations governing access to and exploitation of fisheries, together with the poverty of many small-scale fishermen, makes the task of sustainable management of the fisheries resources very difficult.

At the macro level, there appears to be an under-appreciation by the Government of Bangladesh (GoB) and the international community of the importance of fisheries resources to rural livelihoods and national economic growth. Hence, as has been seen over the last 30 years, fisheries are still marginalized in public development policy and small-scale fisheries are scarcely mentioned in national development plans. Budget allocations to the fisheries sector have declined over time in spite of its increasing importance to the rural economy and nutrition (Alam and Thomson, 2001). This may be mainly due to a lack of knowledge and communication concerning the role played by small-scale fisheries particularly in the case of food security, poverty alleviation and employment generation in the rural society of the country. Finally, it may also be a result of power structure or psychological factors linked to the perception which policy-makers, civil society in general and some aid donors have about small-scale fisheries.

Therefore, the country will have to urgently redefine its fisheries legislation and overhaul the rules and processes if it is to deal with the changed crisis existing in the fisheries resources of the country.

3. Privatization and its consequences

Until now, privatization of public fishing grounds through the so called 'leasing system' is believed to have increased catches to some extent and provided immediate returns to the national exchequer in Bangladesh. At a more specific level, such leasing increases restrictions on the rights of access of the rural poor to resources on which their livelihoods have traditionally been deeply dependent, making them more vulnerable to extreme poverty. Moreover, it has been identified by a number of studies that the efficiency gains are quite insignificant relative to the social loss and suffering associated with restricted fishing rights as a result of leasing the fishing grounds (Hossain et

al., 1999; Rahman et al., 1998).

More importantly, in free societies, the goals of revenue collection have been protection of the rights of the individual and promotion of the well-being of society as a whole. For that reason, poverty alleviation and equity of access have been considered as the central objectives of the fifth five year national development plan of the country (DOF, 2003). Hence, if restricting access is required in a given environment for increasing revenue and catch of the country, then it is very important to make sure that the small-scale fishers and poor people are not excluded from the process as they obtain almost all of their livelihoods and animal protein from capture fisheries.

The political and economic processes of the country are seriously threatening the livelihoods of the small-scale fishers and landless families and this threat has been further exacerbated by the ever increasing demands for aquatic resources in the country (Hoggarth et al., 1999). Apparently, at a more general level, poverty, income inequality and lack of access to inland fisheries resources are the important determinants of the conditions of the rural poor calling for immediate welfare support from the state.

The degradation of property rights resulting from privatization and leasing together with the social climate within which livelihoods based on fishing are pursued, strongly suggest that unless revised management strategies, particularly aimed at the immediate elimination of the leasing system are introduced and pursued, poverty and inequity in the rural areas of Bangladesh are likely to increase over time.

4. Institutional capacity and constraints

In principle, the Department of Fisheries (DOF) within the Ministry of Fisheries and Livestock (MOFL) is solely responsible for the management of Bangladesh's fisheries resources, guided by centrally determined national targets. In reality, the inland fisheries domain of the country is typically managed at three administrative levels: (a) leasing of water bodies covering an area of 20

acres or more for exclusive commercial exploitation by a district administration with a delegated power from the Ministry of Land (MOL); (b) management of water bodies covering an areas of 10 to 20 acres by the Ministry of Youths and Sports through the registered organisation of trained youth; and (c) leasing of areas covering less than 10 acres or less by the administration of the Thana, the terminal administrative unit of the country. Aside from this administrative pattern, there are also reservoirs and road-side water bodies which are administered by departments such as the Bangladesh Water Development Board, the Railway Department and the Roads & Highways Department. It is evident from this situation that DOF's role as having sole responsibility for administering and managing the aquatic resources of the country has apparently been exercised only to a very limited extent. For DOF to be able to take any development initiatives, particularly in the open water areas of the country, the first requirement is for it to take control of water bodies from the MOL and others but the lengthy bureaucratic process involved in doing so frequently causes unacceptable delays which may so critically hamper a project's implementation that failure often results.

The effective capacity of the DOF to enforce the laws and to regulate what goes on in these widely scattered, often isolated fishing grounds, is distinctly limited. During the rainy season, when more than half of the country remains under water, the programme of surveillance over the activities of 13 million or more fishers by a very small number of technical officers and supporting DOF staff becomes very difficult (DOF, 2003). Particularly, the manpower and budget allocated for the purpose of enforcement of the Hilsha fishery, provide DOF with only a weak and selective enforcement capacity that results in an inability to control widespread illegal and destructive fishing practices.

In terms of technical capability, there is no evidence that any technical management models, e.g. surplus production or yield-per-recruit, have ever been applied by DOF to identify optimal harvest strategies. This probably reflects a combination of paucity of resources and institutional capacity of DOF to conduct such assessments for describing the dynamic multi-species fisheries of the country.

During the last three decades, different types of projects have been implemented by DOF

including some access management oriented projects such as the Third Fisheries Project (Ali and Islam, 1998; Ahmad et al., 1998) and the Oxbow Lakes Project (Hasan and Middendorp, 1998). Most of these projects have been designed and implemented with a very limited consultation especially at the community level and a general absence of a coherent strategic framework for a review of the sector. Some few of those projects have targeted reforming the fisheries sector and designing an appropriate inter-sectoral coordination structure; however, the economic modelling of such projects has indicated a negative impact on the poor.

Thus, the growing number of existing and planned national pilot projects is not a guarantee of sustainable and systemic improvements of the resources unless an agile and accomplished implementing agency, including proper policy measures, is put in place to respond to the immediate needs and tasks.

5. National resources status and targets

Compared to its total cultivable area, Bangladesh has a fairly large inland open water area (Fig. 4) for which, however, there is a general absence of reliable resource status information. There is no evidence that the comparison of the real status of resources and the exploitation rate has been made within the socio-economic context of the country, which is very important for policy makers to be able to assess the performance of existing activities. In practice, there have been many changes that have already taken place or are in progress affecting fisheries resources overall, including increase of fishing effort and increase of total demand for fish within the country. In the early sixties, the inland fisheries of Bangladesh contributed about 90% of the total fish production of the country; now however, they account for around 36% only (DOF, 2003). During this period, population has increased twofold (Fig. 5) and per capita fish consumption has fallen - from 11kg in 1970 to 7.5kg by the late 1990s. Moreover, the present output of the capture fishery which takes place over 90% of the total inland area of the country contributes less than that of the culture fishery which takes place in only 10% of the total area (Fig. 6).

A national target was set to raise per capita daily fish consumption of low-income people in rural areas to the level of 25.6–34.4 g by the terminal year 2002 from the existing level of 12.10 g (DOF, 2002). To achieve this, based on an estimated total population, the required production of fish should be raised to 2.30 Mmt; since the reported catch amounts only 1.40 Mmt (DOF, 2002), the projected gap between demand and supply shows that achievement of this target is unlikely to happen in the near future (Fig. 7). A reported steady monotonic increase in landings from some inland aquatic areas may reflect more the result of a desperate effort to catch the last fish from a particular water body rather than being a significant response to the increasing demand of an expanding population (Fig. 8).

Fishing is perhaps only second in importance to rice production as a livelihood strategy and subsistence fishing is carried out by almost everyone in the rural areas of the country with access to a water body (Hoggarth et al., 1999; Hossain, 2001). Besides the non-professional fishers, the continuous activities of over two million professional fishers, usually from the poorest section of society, offers no chance of any immediate effort reduction in the country but rather guarantees the continuation of a very high level of overexploitation and increased scarcity of many target fish species. In confirmation, out of a total 260 inland fish species, 54 face different categories of threats, of which 12 are critically endangered, 28 are endangered, and 14 are vulnerable (FAO, 2002). Moreover, at least 35% of the wetland-dependent mammal, amphibian, and reptile species are also either extinct, threatened, or commercially threatened (NERP, 1995). More importantly, this resource degradation has resulted in a chronic decline in the fisheries sector's contribution to total export earnings (Fig. 9), a fact which is especially alarming given the largely agro-based economy of the country. The fact is that government has been found to be critically struggling in solving the present crisis affecting the most important fisheries of the country and the compliance with rules and regulations by fishers has generally been low.

Ultimately, the country will need to ensure some form of more active representation by user groups in the processes of surveillance, protection and enhancement of its aquatic resources if it is to

fully achieve the stated national targets to which it aspires.

6. Choosing an option: Community Based Fisheries Management (CBFM) is consistent to the reality

The Constitution of Bangladesh unequivocally undertakes that the state shall endeavour to ensure equality of opportunity to all citizens and shall adopt effective measures to remove social and economic inequality to ensure equitable distribution of resources. From both the economic and social standpoints, it is obvious that the inland water resources are important assets that should be managed effectively with the highest priority. Under the prevailing socio-economic conditions, it is also unlikely that government initiatives alone will guarantee adequate management for the protection of the fisheries resources and better nutrition for the majority of the people.

Central to addressing the government's difficulties, Community Based Fisheries Management (CBFM), as one of many possible forms of co-management, is being increasingly proposed as a suitable fisheries resource management option for the country, which offers the prospect of relief from some of the more negative aspects of a centralized management system (Berkes 1991; Pomeroy and Williams 1994). As a remedy to problems created by other management arrangements, the focus of CBFM is more on the direct involvement of resource stakeholders in the planning and control of resource use, offering the potential for improving resource sustainability. Furthermore, recent endorsements by International bodies regarding the need for greater support to small-scale fisheries to move towards participatory management provide legitimate grounds on which to convince the country over the introduction and implementation of the CBFM approach, given the scale of employment and income provided by such fisheries and their role in food security. The potential to increase the present fish catch of the country is great if its vast open water areas were to be managed with a participatory approach under the leadership of DOF (Fig. 10). Furthermore, the preliminary findings from the experiences of past and present pilot projects also advocate that fostering the management of open water areas through community participation will be

a more promising route to achieving national and international policy objectives (Table 2).

Faced with the complex nature of its fisheries and the level of social involvement, along with a limited national capacity, the government of Bangladesh should consider the implementation of CBFM approaches as a feasible means of achieving its objectives in this sector.

7. Conclusion

Recognizing the existing constraints in the inland fisheries of Bangladesh, it is evident that review of the fisheries sector policy must be seen within the context of the development of an appropriate regime for the management of fisheries resources of the country. There is a positive potential for co-management in the country, but this will only be successful under the right conditions. In this regard, it is essential to develop a dynamic partnership between neighbouring communities and interest groups on the one hand and the government on the other to support a greater participatory approach, using the capacities and interest of the former complemented by the ability of the latter to offer enabling legislation and administrative. Hence, co-management and its implementation are in its early stages in the country, but may be the key to alternative fisheries resource management in future.

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Table legends

Table 1 History of open water fisheries management policy changes in Bangladesh

Table 2 Consistency between policy objectives and the observed potential in CBFM projects of Bangladesh

Figure legends

Fig. 1. Map of Bangladesh.

Fig. 2. Aquatic bio-diversity of the inland fisheries resources in Bangladesh (data from DOF, 2002).

Fig. 3. Relative reasons contributing to the catch decline and access reduction in the inland water area (data from Toufique, 2000).

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Fig. 6. Relative contribution of area and catch by capture and culture fisheries (data from DOF, 2002).

Fig. 7. Projected gaps between fish demand and supply (data from FAO, 2005).

Fig. 8. Relative catch increase claimed in the inland capture fishery (data from DOF, 2002).

Fig. 9. Decline in export earnings from fish (data from DOF, 2002).

Fig. 10. Catch variation with types of management practices (data from DOF, 2002 and Rahman et al., 1998).

Table 1
History of open water fisheries management policy changes in Bangladesh

Period	Management initiatives	Main objectives	Major achievements and outcomes
Pre-colonial (Before 1757)	No report of management measures	The sole aim was to exploit the resources.	No report of scarcity. (Hossain, et al., 1999)
Colonial (1757-1971)	Feudal lords (zamindars) system.	The collection of tax in exchange for user rights by feudal lords on behalf of the colonial ruler.	Limited access for commercial purposes
	Innovation of East Bengal State Acquisition and Tenancy Act of 1950	End of the Feudal lords system Reversion of public water bodies to state control	Ministry of Land (MOL) obtained the authority and property rights for public water bodies Initiation of periodic leasing. (Hossain, *et al*., 1999)
	The 1950 Fish Conservation Act.	Restriction of using certain gears and fishing of juvenile and brood fish in order to replenishing wild stock through natural recruitment	Weak enforcement and poor compliance
Post Colonial (1971 – to date)	The Marine Fisheries Ordinance, 1983	Conservation of marine resources	Poor compliance
	The Local Government (Union Parishad) Ordinance, 1983	To sell (lease out) fishing rights by local administrations and increase government revenue collection.	No specific conservation arrangements
	The Land Management Manual, 1990.	To provide authority and proprietary rights for MOL over state-owned water bodies over 20 acres. To maximize revenue income. (Toufique, 1997)	No specific conservation arrangements
	Amendment of The local Government (Union Parishad,1983) Ordinance, 1993	To give authority to a Local Administration to sell all closed water bodies up to an area of 20 acres with an increase of 25% lease value over the previous year. (Toufique, 1997)	No specific conservation arrangements
	Stops of leasing Jolmohals (rivers and canals), 1995	To ensure open access of poor and landless fishers	Eliminated fishing restrictions and the revenue requirements
	Memorandum of Understanding, 1997, Ministry of Land (MOL)	To transfer all closed public water bodies up to an area of 20 acres to Ministry of Youths and Sports To create more employment opportunity for youth	Useful in employing trained young people
	National Fisheries Policy (NFP), 1998	Identifying and organizing genuine fishers Gradual abolition of leasing with gear specific licensing. (Hossain, *et al*., 1999)	Attempt at equity and conservation (Craig, *et al*., 2004)
	The National Water Policy (Ministry of Water Resources, 1999)	Reserving wetlands for fish	Poorly implemented due to lack of inter-sectoral coordination.

Table 2
Consistency between policy objectives and the observed potential of CBFM projects in Bangladesh

Fisheries sector policy objectives (NFP, 1998)	**National Policy objectives** (Planning Commission, 1998)	**International endorsements**	**Observed potential of CBFM approach in Bangladesh**
Increase fish production, fulfill the demand for animal protein	Increase production and food security	Self-sufficiency	Improved capital investment in achieving economic, social and environmental objectives (Sultana and Thompson, 2000, Nielsen *et al*., 2004)
Alleviate poverty, expanding employment opportunities, improving socio-economic conditions	Poverty alleviation	Fighting poverty	Tangibly improves the life of the poorest of the poor (Hoggarth, 1999) Generates new employment opportunityies (Sultana and Thompson, 2000) Initiates external supports (i.e. Micro-credit operation)
	Empowerment	Empowerment & gender development (UN, 1945, 2000)	Ensures increased access to the resources (Pomeroy, 1996) Empowerment & gender development achieved in project area as a result of increased awareness through training, education, and information exchange process
	Transparency	Transparency (UN, 2000)	Obtains an open, transparent, and autonomous management process (Viswanathan, *et al*., 2002)
	Political and social stability	Prioritize human rights (UN, 2000)	Minimizes social conflicts and improves social cohesion, co-operation and coordination (Sultana and Thompson, 2000)
Achieve economic growth, maintain ecological balance, conserve biodiversity	Economic prosperity	Uniform development (World Bank, 1999; UN, 1945)	Promotes interdisciplinary approaches and inter-sectoral cooperation and coordination. (Middendorp and Thompson, 1999) Formulates integrated strategies for the expansion and diversification of economic activities
	Sustainability & conservation	Environmently friendly development (UN, 1992)	Promotes understanding of sustainability (Middendorp and Thompson, 1999) Maximizes the use of indigenous knowledge and expertise to provide sustainability (Thompson, et al., 1998) Enables the community to develop more sustainable and productive fishery management process (Ahmed, *et al.*, 1997)
	Decentralization	Equitable distribution (FAO, 1995b)	Decentralizes authority and responsibility (Hossain, *et al*., 1999)
	Limiting government expenditure	Reducing overhead cost (FAO, 1999)	Direct involvement of users groups requires less to be spent for administration and enforcement purposes (Hossain, *et al*., 1999)